



AT Commands

for the Apple Internal USB Modem

Apple Computer, Inc.

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Entering AT Commands

To enter an AT command, you must be using a terminal emulation application that provides you with a text area for entering commands and receiving command feedback, such as ZTERM and MacTerminal.

Typing an AT Command

The command line is made up of three elements: the prefix, the body, and the termination character. The command line prefix consists of the characters “AT” or “at” or, to repeat the execution of the previous command line, the characters “A/ ” or “a/ ” or, to escape from data mode, the characters, “+++”.

For example, to answer an incoming call using the A (answer) command, you type

```
ATA
```

and then press the Return key.

Using Command Parameters

There are two type of commands: action commands and parameter commands. Action commands may be “executed”, or “tested”. The parameter commands may be “set” or “read”.

Some parameter commands require a parameter, which is usually a single digit that determines the command’s behavior. For example, the parameter n in the Hn command is either 0 (to hang up) or 1 (to go off-hook).

To hang up using this command, type

```
ATH0
```

and then press the Return key.

Some parameter commands require parameters that are not single digits. For example, the Dn command accepts one or more single-character dialing modifiers, plus a telephone number. To use touch-tone dialing (T) to dial the telephone number 123-4567, type

```
ATDT1234567
```

and then press the Return key.

Entering Multiple Commands

You can enter multiple AT commands on the same line, as long as the line begins with “AT” and ends with a carriage return.

You usually use multiple commands on the same line to configure your modem. For example, to request that the modem use the factory default settings (&F command) and display current configuration and stored profile (&V command), type

```
AT&F&V
```

and then press the Return key.

Entering and Exiting Command Mode

The modem must be in the command mode before you enter an AT command. If you are connected to another modem, use the +++ command to switch to command mode. (You can later return to your connection using the On command.)

For example, to enter an AT command when a connection is active, type

+++

to enter command mode; then type the AT commands you want to issue; and finally type

ATO

to return to your connection.

AT Command Reference

AT commands control your modem's settings and operation. This section provides detailed information on all AT commands supported by the Apple internal modem.

+++ (switching to command mode)

The +++ command forces a modem that is already connected to enter the command state, so you can send commands to your modem without breaking its connection with the remote modem. In some cases, you must send "AT" after the +++ command. Unlike other AT commands, the +++ command is not preceded by the "AT" prefix. The command is accepted when the "+++" is typed, so you do not follow this command with a carriage return.

In order to prevent the modem from responding to "+++" (called the "escape sequence") in transmitted data, it requires a one-second pause before and after the sequence. Without the pause, the modem treats the "+++" sequence as data rather than a command.

You can change the escape sequence from +++ to another string of characters by setting the S2 register. You can change the pause time required for the escape sequence by setting the S12 register.

A (answering an incoming call)

The A command forces the modem to go off-hook in answer mode. Use this command to manually answer an incoming call when you know that another modem is calling. When the modem detects an incoming call, it sends the RING result code to your computer. If a telecommunications application is active, the result code appears on your screen. For example, to answer an incoming call, type: ATA

A/ (repeating the last command)

The A/ command repeats the previous command. This command is especially useful for reissuing a dial command that failed because of a busy line or no answer. Unlike other AT commands, the A/ command is not preceded with the "AT" prefix. The command is accepted as soon as the "A/ " is typed, so you do not follow this command with a carriage return.

%Cn (selecting data-compression settings)

Enable or disable data compression negotiation. The modem can only perform data compression on an error corrected link. The parameter value, if valid, is written to S41 bits 0 and 1.

- %C0—Disables data compression.
- %C1—Enables MNP 5 data compression.
- %C2—Enables V.42bis data compression.
- %C3 (default)—Enables both V.42bis and MNP 5 data compression.

&Cn (modifying the carrier detection response)

The modem controls the RLSD output. The parameter value, if valid, is written to bit 5 of the S21 register.

- &C0—RLSD remains ON all the times.
- &C1 (default)—RLSD follows the state of the carrier.

Dn (entering a dialing string)

The Dn command causes the modem to dial a telephone number. n is the telephone number you want to dial. The telephone number can include the characters 0–9, A–D, #, and * (A, B, C, D, #, and * can be

used only when touch-tone dialing is selected). Dashes, parentheses, and spaces are ignored. For example, to dial the telephone number 123-4567, type: ATD 123-4567

Note: The space and dash in the telephone number are ignored.

Dialing Modifiers

You can also include a number of dialing modifiers in the n parameter to change the way dialing is handled. The following dialing modifiers can be used with the Dn command:

! (flash on-hook)

The modem will go on-hook for the time specified by the S29 register (if S29 > 0) and then back offhook. This modifier can be placed anywhere in the dialing string.

Example: ATDT!123-4567

This command instructs the modem to go on-hook and back off-hook, and then use touchtone dialing to dial the telephone number 123-4567.

@ (wait for silence)

The modem will wait for at least 5 seconds of silence after in the call progress frequency band before continuing with the next dial string parameter. If the modem does not detect five seconds of silence before the expiration of the call abort timer(S7), the modem will terminate the call attempt with a NO ANSWER message. If busy detection is enabled, the modem will terminate the call with the BUSY result code. If answer tone arrives during execution of this parameter, the modem handshakes.

Example: ATD1234567@8888

This command dials the telephone number 123-4567, waits for the call to be answered, and then dials the extension 8888.

, (dial pause)

The modem will pause for a time specified by S8 register before dialing the digits following “,”.

Example: ATDT123-4567,,,888

This command uses touch-tone dialing to dial the telephone number 123-4567. It then pauses for six seconds before dialing the telephone extension 888.

; (return to command mode after dialing)

The ; dialing modifier instructs the modem to return to command state after dialing a number. You can use this modifier to issue additional AT commands while remaining offhook. The semicolon must be placed at the end of the dial command, but can then be followed by other commands.

Example: ATD1234567;X1DT,8

This command instructs the modem to dial the telephone number 123-4567 and then return to command state. Once the modem is in command state, it pauses (indicated by the comma) and then dials the number 8, without checking for a dial tone (X1).

& (wait for credit-card tone)

Wait for credit-card dialing tone before continuing with the dialing string. If the tone is not detected within the time specified by the S7(US models) or S6(W-class), the modem will hang up and generate

an error message.

Example: ATDT123-4567&112233

This command dials the telephone number 123-4567 and then waits for a credit card tone before dialing 112233.

^ (enable calling tones)

The ^ dialing modifier enables calling tones for the current dial attempt. By default, calling tones are disabled for Internal 56k modems sold in North America. You might want to enable calling tones with the ^ modifier if, for instance, the device that you are calling uses calling tones to differentiate between a voice, fax, or data call.

Example: ATDT^123-4567

This command instructs the modem to emit calling tones when the remote device answers the call.

L (redial the last telephone number)

The L dialing modifier instructs the modem to redial the last telephone number dialed. The L modifier must be placed immediately after the D in the Dn command. The modem ignores any characters placed after the L modifier. To display the last-dialed number (with a terminal emulation application), use the following command: ATDL?

Example: ATDT1234567
ATDL

The first command dials the telephone number 123-4567. The second command redials the telephone number.

P (pulse dial)

The P dialing modifier instructs the modem to use pulse dialing. If you use P between the digits of a telephone number, the digits following P are pulse-dialed.

Example: ATDP123-4567

This command uses pulse dialing to dial the telephone number 123-4567.

T (touch-tone dial)

The T dialing modifier instructs the modem to use touch-tone dialing.

Example: ATDT123-4567

This command uses touch-tone dialing to dial the telephone number 123-4567.

W (wait for a dial tone)

The modem will wait for dial tone before dialing the digits following "W". If dial tone is not detected within the time specified by S7(US) or the country specific time, the modem will abort the rest of the sequence, return on-hook, and generate an error message.

Example: ATDT8W123-4567

This command instructs the modem to dial 8, then wait for a dial tone before dialing the telephone number 123-4567.

&Dn (disconnecting using DTR signaling)

This command interprets the ON to OFF transition of the DTR signal from the computer.

- &D0 (default)
 - DTR is ignored (assumed ON). Allows operation with computers that don't provide DTR signaling.
- &D1
 - When DTR drops, the modem returns to the asynchronous command state without disconnecting, as if the asynchronous escape sequence had been entered.
 - When DTR drops, the modem hangs up. Autoanswer is inhibited.
- &D2
 - When DTR drops, the modem hangs up. Autoanswer is inhibited.

Example: AT&D2

This command enables DTR hangup for all values of the &Qn command.

En (turning echo on and off)

The En command controls whether commands that you type are echoed back to your computer while the modem is in command mode.

- E0—Disables echo to the computer in command mode.
- E1 (default)—Enables echo to the computer in command mode.

Example: ATE1

This command instructs the modem to echo characters it receives from the computer while in command mode.

%En (Enable/Disable Line Quality Monitor and Auto-Retrain or Fallback/Fall Forward)

The %En command controls whether the modem will automatically monitor the line quality and request a retrain (%E1) or fall back when line quality is insufficient or fall forward when line quality improves (%E2).

- %E0—Disables line quality monitor and auto-retrain.
- %E1—Enables line quality monitor and auto-retrain.
- %E2 (default)—Enables line quality monitor and fallback/fallforward.

Example: AT%E1

This command tells the modem to monitor the line quality and request a retrain if the quality changes.

&F (loading a factory configuration)

The modem loads the factory default configuration(profile). The factory default are identified for each command and in the S-register description. A configuration (profile) consists of a subset of S-Registers.

&Gn (selecting the guard tone)

The &Gn command determines whether the modem transmits a guard tone when answering. The parameter value, if valid, is written to S23 bits 6 and 7.

- &G0—Disables guard tones (US default).
- &G1—Disables guard tones.
- &G2—Selects 1800 Hz guard tone.

+GCI (country select)

This extended syntax command indicates and selects the country of installation for the modem. This parameter selects the settings for any operational parameters that need to be adjusted for national regulations or telephone networks.

Syntax

+GCI=<country_code>

Default

If the modem is specified for use in only one country, that country code is the default. Otherwise, the default is the expected country of sale or first installation. The modem may use hardware means to select the country of installation, in which case the modem uses that to determine the default value.

Reporting Current or Selected Values

Command: +GCI?

Response: +GCI: <current country_code>

Example: +GCI: 3D Indicates that the modem is set for France.

Select country parameters corresponding to entered country code (n).

Country	ATI12=D1 Code(n)
Australia	09
Austria	0A
Belgium	0F
Canada	20
China	26
Czech Republic	2E
Denmark	31
Finland	3C
France	3D
Germany	42
Greece	46
Guam	48
Hong Kong	50
Iceland	52
India	53
Indonesia	54
Ireland	57

Country Parameters (cont.)

Country	ATI12=D1 Code(n)
Italy	59
Japan	00
Korea	61
Latin America	B5 ¹
Malaysia	6C
Netherlands	7B
New Zealand	7E
Norway	82
Philippines	89
Poland	47
Portugal	8B
Slovak Republic	2E ²
Singapore	9C
South Africa	9F
Spain	A0
Sweden	A5
Switzerland	A6
Taiwan	FE
Thailand	A9
United Kingdom	B4
United States	B5

¹ Shared country code with United States

² Shared country code with Czech Republic

Hn (disconnecting)

You use the Hn command to place the modem on-hook (hang up) or take the modem offhook (equivalent to lifting the telephone receiver).

- H1—Takes the modem off-hook and places it in command mode.
- +++

Example: ATH0

Suppose that you want to end a connection that you have established with another modem. This example uses the +++ command to enter command mode, then uses H0 to hang up.

In (displaying information about the modem)

The In command instructs the modem to provide information about itself.

- I0—Reports product code, e.g., 56000
- I1—Reports the least significant byte of the stored checksum in decimal, e.g., Apple Version 1.0 Friday, August 24, 2001
- I2—Reports OK if ROM checksum is valid; otherwise, reports ERROR.
- I3—Reports driver version.
- I4—Reports OEM defined identifier string, e.g., Apple Internal Modem
- I5—Reports the Country Code parameter, e.g., B5 for the United States
- I6—Reports modem data pump model and internal code revision, e.g., 19.1
- I9 —Reports the country profile that the modem is set to (note: some countries may share the same country profile).

Kn (controlling the flow control method)

You use the &Kn command to select the flow control method used for a connection between a computer and a modem.

- &K0—Disables flow control.
- &K3 (default)—Enables hardware flow control (RTS/CTS).
- &K4—Enables software flow control (XON/XOFF).
- &K5—Enables transparent XON/XOFF flow control.
- &K6—Enables both RTS/CTS and XON/XOFF flow control.

Ln (adjusting the speaker volume)

You use the Ln command to adjust the modem speaker volume. (If you want to turn the modem speaker on or off, see the Mn command.)

- L0—Lowest speaker volume.
- L1 (default)—Low speaker volume.
- L2—Medium speaker volume.
- L3—High speaker volume.

Mn (turning the speaker on or off)

You use the Mn command to turn the modem speaker on or off. (If you want to change the speaker volume, see the Ln command.)

- M0—Speaker is always off.
- M1 (default)—Speaker is on during call establishment, until the modem detects a carrier tone.
- M2—Speaker is always on.
- M3—Speaker is off during receiving carrier and dialing, but on during answering

+MS (Select Modulation)

This extended-format compound parameter controls the manner of operation of the modulation capabilities in the modem. It accepts six subparameters.

Syntax

+MS=[<carrier>[,<automode>[,<min_tx_rate>[,<max_tx_rate>[,<min_rx_rate>[,<max_rx_rate>]]]]]]

Where: Possible <carrier>, <min_tx_rate>, <max_tx_rate>, <min_rx_rate>, and <max_rx_rate> values are listed below.

See the following table for +MS Command Supported Rates.

Modulation	<carrier>	Possible (<min_rx_rate>, <min_rx_rate>, (<min_tx_rate>), and <max_tx_rate>) Rates (bps)
Bell 103	B103	300
Bell 212	B212	1200 Rx/75 Tx or 75 Rx/1200 Tx
V.21	V21	300
V.22	V22	1200
V.22 bis	V22B	2400 or 1200
V.23	V23C	1200
V.32	V32	9600 or 4800
V.32 bis	V32B	14400, 12000, 9600, 7200, or 4800
V.34	V34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
K56flex	K56	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000
V.90	V90	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 44000, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000

Defined Values

- <carrier> A string which specifies the preferred modem carrier to use in originating or answering a connection. <carrier> values are strings of up to eight characters, consisting only of numeric digits and upper case letters. <carrier> values for ITU standard modulations take the form: <letter><1-4 digits><other letters as needed>.
- <automode> A numeric value which enables or disables automatic modulation negotiation (e.g., ITU-T V.32*bis* Annex A or V.8).
- 0 Automode disabled.
 - 1 Automode enabled. (Default.)
- <min_rx_rate> and <max_rx_rate> Numeric values which specify the lowest (<min_rx_rate>) and highest (<max_rx_rate>) rate at which the modem may establish a receive connection. May be used to condition distinct limits for the receive direction as distinct from the transmit direction. Values for this subparameter are decimal encoded, in units of bit/s. The possible values for each modulation are listed in the table above. Actual values will be limited to possible values corresponding to the entered <carrier> and fall-back <carrier> as determined during operation. (Default = lowest (<min_rx_rate>) and highest (<max_rx_rate>) rate supported by the selected carrier.)
- <min_tx_rate> and <max_tx_rate> Numeric values which specify the lowest (<min_tx_rate>) and highest (<max_tx_rate>) rate at which the modem may establish a transmit connection. Non-zero values for this subparameter are decimal encoded, in units of bit/s. The possible values for each modulation are listed in the table above. Actual values will be limited to possible values corresponding to the entered <carrier> and fallback <carrier> as determined during operation. (Default = lowest (<min_tx_rate>) and highest (<max_tx_rate>) rate supported by the selected carrier.)

Reporting Current or Selected Values

Command: +MS?

Response: +MS:

<carrier>,<automode>,<min_tx_rate>,<max_tx_rate>,<min_rx_rate>,<max_rx_rate>

Note: The current active settings are reported under control of the +MR parameter.

Example: +MS: K56, 1,75,33600,75,56000

For default values. This example allows maximum system flexibility to determine optimal receive and transmit rates during operation.

Reporting Supported Range of Parameter Values

Command: +MS=?

Response: +MS: (<carrier> range),(<automode> range),(<min_tx_rate> range), (<max_tx_rate> range),(<min_rx_rate> range), (<max_rx_rate> range)

Example: +MS: (B103,B212,V21,V22,V22B,V23C,V32,V32B,V34, K56,V90),(0,1),(75 33600),(75-33600),(75-56000),(75-56000)

Result Code

OK Valid subparameter string

ERROR Otherwise.

\Nn (setting error-correction mode)

The \Nn command is used to specify the type of error correction to be negotiated.

- \N0—Selects normal speed-buffered mode; disable error correction mode.
- \N1—Selects direct mode; no error correction used.
- \N2—Selects reliable (error-correction) mode. The modem will first attempt a LAP-M connection and then an MNP connection. Failure to make a reliable connection results in the modem hanging up.
- \N3—Selects auto-reliable mode. This command operates the same as \N2, except that if the modem cannot make a reliable connection, it falls back to the speed-buffered normal mode.
- \N4—Selects LAP-M error-correction mode. Failure to make a LAP-M error-correction connection results in the modem hanging up.
- \N5—Selects MNP error-correction mode. Failure to make an MNP error-correction connection results in the modem hanging up.

Example: AT\N2

This command sets the modem to make a reliable connection. If the modem cannot make a reliable connection, it will not connect.

On (switching to on-line mode)

The On command returns the modem to the on-line state from the command state. If the modem is not connected to another modem, the command returns the ERROR result code.

- O0—Returns the modem to the on-line state without retraining.
- O1—Returns the modem to the on-line state after retraining.

P (using pulse dialing)

The P command makes pulse dialing the default dialing method. To indicate that all subsequent dialing should be conducted in pulse dial mode, the P command sets bit 5 of the S14 register. You can override the P command for a specific dial attempt by adding the T modifier to the dialing string.

Example: ATP
ATD123-4567

This example sets the default dialing method to pulse dialing and then dials the telephone number 123-4567.

&Pn (selecting the pulse mode make/break ratio)

You use the &Pn command to specify the make/break ratio used for pulse dialing. The parameter, if valid, is written to bits 3 and 4 of the S28 register. m &P0 (default)—Make = 39% and Break = 61% at 10 pulses per second (for US and Canada).

- &P1—Make = 33% and Break = 67% at 10 pulses per second (for UK and Hong Kong).
- &P2—Make = 39% and Break = 61% at 20 pulses per second (for Japan).
- &P3—Make = 33% and Break = 67% at 20 pulses per second.

Qn (displaying result codes)

The Qn command determines whether the modem sends a result code back to the computer after performing each AT command. (The format of the result codes is determined by the Vn command.)

- Q0 (default)—Result codes enabled.
- Q1—Result codes disabled.

Example: ATQ0

This command sets the modem to display result codes after each AT command.

Sn (read/write S-register)

The modem selects an S-Register, performs an S-Register read or write function, or reports the value of an S-Register. The parameter n can be omitted, in which case the last S-Register accessed will be assumed. The S can be omitted for AT= and AT?, in which case the last S-Register accessed will be assumed.

For example:

n	Establishes S-Register n as the last register accessed.
n=v	Sets S-Register n to the value v.
n?	Reports the value of S-Register n.

T (using touch-tone dialing)

The T command makes touch-tone dialing the default dialing method. You can override the T command for a specific dial attempt by adding the P modifier to the dialing.

Example: ATT

ATD1234567

This example sets the default dialing method to touch-tone and then dials the telephone number 1234567.

Vn (setting result code format)

The Vn command determines whether result codes are displayed as numbers (numeric form) or words (verbose form).

- V0—Switches to short form(numeric). (No line feed character is issued following the code.)
- V1 (default)—Switches to long form(verbose). (A line feed character is issued following the code.)

Example: ATV1

This command instructs the modem to display result codes as words.

&V (displaying a user profile)

The &V command displays the active profile, including command and S-register settings.

Wn (specifying connection result codes)

This command controls the format of CONNECT messages. The parameter value, if valid, is written to S31 bits 2 and 3. Note that the Wn command can be overridden by register S95 bits (see S95 description.)

- W0 (default)—Upon connection, the modem reports the DTE speed (for example, CONNECT 57600).

ATS7 establishes S7 as the last accessed register.

AT=40 Sets the contents of the last register accessed to 40.

ATS=20 Sets the contents of the last register accessed to 20.

- W1—Upon connection, the modem reports the line speed (for example, CARRIER 14400), error-control protocol (for example, PROTOCOL LAP-M), data-compression protocol (for example, COMPRESSION V.42BIS), and DTE speed (for example, CONNECT 57600).
- W2—Upon connection, the modem reports the line speed (for example, CONNECT 14400).
- W3 - Upon connection, the modem reports DCE speed and the error correction protocol.

Xn (using extended result codes)

You use the Xn command to set which result codes the modem can return. This command also enables or disables busy-tone and dial-tone detection during the dialing process.

- X0—Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, and NO ANSWER result codes. Blind dialing is enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE. The value 000b is written to S22 bits 6, 5, and 4, respectively.
- X1—Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX (XXXX = rate). Blind dialing enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE. The value 100b is written to S22 bits 6, 5, and 4, respectively.
- X2—Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO DIALTONE, NO ANSWER, and CONNECT XXXX. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO DIAL TONE will be reported instead of NO CARRIER. The value 101b is written to S22 bits 6, 5, and 4, respectively.
- X3—Enables monitoring of busy tones; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX. Blind dialing is enabled/disabled by country parameters. If dial tone detection is enforced and dial tone is not detected, NO CARRIER will be reported. The value 110b is written to S22 bits 6, 5, and 4, respectively.
- X4 (default)—Enables monitoring of busy tones; send all messages. The value 111b is written to S22 bits 6, 5, and 4, respectively. (Default.)

Example: ATX1DT5556767

This command disables busy-tone and dial-tone detection, enables all result codes, and dials the number 555-6767. This can be a useful addition to a dial string when the modem is failing to make a connection because it is misinterpreting the ring as a busy tone or not recognizing the dial tone.

Z (Reset to Default Configuration)

This command instructs the modem to reset to default values as altered by non-volatile parameter storage. If the modem is connected to the line, it will be disconnected from the line, terminating any call in progress.

All of the functions of the command are completed before the modem issues the result code. The DTE should not include additional commands on the same command line after the **Z** command because such commands are ignored.

Syntax

Z

Result Code

OK

V.92 / V.44

This section provides commands to support V.92 / V.44.

+DS44=<direction> (V.44 - Data Compression protocol)

This command controls the V.44 data compression function if provided in the modem.

<direction> specifies the desired direction(s) of operation of the data compression function, from the modem point of view.

- **+DS44=0** - Negotiated ... no compression
- **+DS44=1** - Transmit only
- **+DS44=2** - Receive only
- **+DS44=3** - Both directions, accept any direction

Recommended default: 3

+PCW=<call waiting> (Call Waiting enable)

This command controls the action to be taken upon detection of call waiting in a V.92 modem.

- **+PCW=0** - Toggle V.24 Circuit 125 and collect Caller ID if enabled by +VCID
- **+PCW=1** - Hang up
- **+PCW=2** - Ignore V.92 call waiting

Default: 0

+PMH=<value> (Modem on Hold enable)

This extended-format compound numeric parameter controls whether or not modem on hold procedures are enabled during V.92 operation.

- +PMH=0** - Enables V.92 modem on hold
- +PMH=1** - Disables V.92 modem on hold

Default: 0

+PMHR (Initiate Modem on Hold)

This command requests the modem to initiate or to confirm a modem on hold procedure. The modem will return **ERROR** if Modem on Hold is not enabled or if the modem is in an idle condition. The will return the string response +PMHR: n where n is a decimal value corresponding to the Modem on Hold timer value received or the request status during the modem on hold exchange procedure as defined below. This response may be delayed depending upon the context under which the +PMHR command is made, i.e., if the +PMHR is in response to an incoming Modem on Hold or if it is initiating a request.

Return value definitions:

- +PMHR: 0** V.92 Modem on Hold Request Denied or not available. The modem may initiate anotherModem-on-hold request later.
- +PMHR: 1** MOH with 10 second timeout Granted
- +PMHR: 2** MOH with 20 second timeout Granted
- +PMHR: 3** MOH with 30 second timeout Granted
- +PMHR: 4** MOH with 40 second timeout Granted
- +PMHR: 5** MOH with 1 minute timeout Granted

+PMHR: 6 MOH with 2 minute timeout Granted
+PMHR: 7 MOH with 3 minute timeout Granted
+PMHR: 8 MOH with 4 minute timeout Granted
+PMHR: 9 MOH with 6 minute timeout Granted
+PMHR: 10 MOH with 8 minute timeout Granted
+PMHR: 11 MOH with 12 minute timeout Granted
+PMHR: 12 MOH with 16 minute timeout Granted
+PMHR: 13 MOH with indefinite timeout Granted
+PMHR: 14 MOH Request denied. Future requests will also be denied during this session.

+PIG=<value> (PCM upstream ignore)

This command controls the use of PCM upstream in a V.92 modem.

- +PIG=0 - Enable PCM upstream
- +PIG=1 - Disable PCM upstream

Default: 0

+PQC=<value> (V.92 Quick Connect, Phase 1 and Phase 2 Control)

This command controls the global enabling or disabling of the V.92 shortened Phase 1 and Phase 2 startup procedures, not the initiation thereof. This command is used in conjunction with the +PSS command.

- +PQC=0 - Enable Short Phase 1 and Short Phase 2
- +PQC=1 - Enable Short Phase 1
- +PQC=2 - Enable Short Phase 2
- +PQC=3 - Disable Short Phase 1 and Short Phase 2

Default: 0

S-Registers

S-Parameter Summary

Register	Function	Units
S0	Number of Rings to Automatic Answer	rings
S1	Ring Counter	rings
S2	Escape Character	ASCII
S3	Line Termination Character	ASCII
S4	Response Formatting Character	ASCII
S5	Command Line Editing Character	ASCII
S6	Wait Time for Dial Tone Before Blind Dialing, or After “W” Dial Modifier	s
S7	Wait Time For Carrier After Dial, For Silence, or For Dial Tone After “W” Dial Modifier	s
S8	Pause Time for Dial Delay Modifier	s
S10	Carrier Loss Disconnect Time	0.1 s
S11	DTMF Tone Duration	0.001 s
S12	Escape Prompt Delay	0.02 s
S18	Test Timer	s
S29	Flash Dial Modifier Time	10 ms
S30	Disconnect Inactivity Timer	10 s
S46	Data Compression Control	-
S95	Result Code Messages Control	-

AT=x - Write to Selected S-Parameter

This command writes the value x to the currently selected S-Parameter. An S-Parameter can be selected by using the ATSn command. All of the S-Parameters will return the OK response if x is a number. Some registers may not be written due to country specific PTT limitations.

Syntax

S=x

Result Codes

OK For all arguments.

AT? - Read Selected S-Parameter

This command reads and displays the selected S-Parameter. An S-Parameter can be selected by using the ATSn command.

Syntax

S=?

Result Codes

OK

Sn - Read/Write S-Parameter

The modem selects an S-Parameter, performs an S-Parameter read or write function, or reports the value of an S-Parameter.

n Establishes S-Parameter n as the last register accessed.

n=v Sets S-Parameter n to the value v.

n? Reports the value of S-Parameter n.

The parameter n can be omitted, in which case the last S-Parameter accessed will be assumed. The S can be omitted for AT= and AT?, in which case the last S-Parameter accessed will be assumed. For example:

ATS7 establishes S7 as the last accessed register.

AT=40 sets the contents of the last register accessed to 40.

ATS=20 sets the contents of the last register accessed to 20. If the number "n" is outside the range of the S-Parameters available, the modem will return the ERROR message. If the value "v" is outside the range permitted for a given S-Parameter, the modem will return the ERROR message. Input and output are always in decimal format. Note that some S-Parameters are read-only. In some cases, writing to the S-Parameter will appear to be accepted but the value will not actually be written.

Factory Defaults

The factory default values are stored in the Registry and are loaded into the active configuration at power up or by the Z command. In addition, the default profile is subsequently loaded, and may change some of the factory default values. The default values in the Registry may be loaded at any time by entering the &F command.

S-Parameter Definitions

S0 - Number of Rings to Automatic Answer

S0 sets the number of the rings required before the modem automatically answers a call. Setting this parameter to zero disables auto-answer mode.

Range: 0-255 rings

Default: 0

S1 - Ring Counter

S1 is incremented each time the modem detects a ring signal on the telephone line. S1 is cleared if no rings occur over an eight second interval.

Range: 0-255 rings

Default: 0

S2 - Escape Character

S2 holds the decimal value of the ASCII character used as the escape character. The default value corresponds to an ASCII '+'. A value over 127 disables the escape process, i.e., no escape character will be recognized.

Range: 0-255, ASCII decimal

Default: 43 (+)

S3 - Line Termination Character

S3 sets the decimal value of the command line and result code terminator character. Pertains to asynchronous operation only.

Range: 0-127, ASCII decimal

Default: 13 (Carriage Return)

S4 - Response Formatting Character

S4 sets the decimal value of the character generated by the modem as part of the header, trailer, and terminator for result codes and information text, along with the S3 parameter (see the description of the V parameter for usage). If the value of S4 is changed in a command line, the result code issued in response to that command line will use the new value of S4. The Response Formatting character is output after the Line Termination character if verbose result codes are used.

Range: 0-127, ASCII decimal

Default: 10 (Line Feed)

S5 - Command Line Editing Character

S5 sets the decimal value of the character recognized by the modem as a request to delete from the command line the immediately preceding character. The modem will not recognize the Command Line Editing character if it is set to a value that is greater than 32 ASCII. This character can be used to edit a command line. When the echo command is enabled, the modem echoes back to the local DTE the Command Line Editing character, an ASCII space character and a second Command Line Editing character; this means a total of three characters are transmitted each time the modem processes the Command Line Editing character.

Range: 0-32, ASCII decimal

Default: 8 (Backspace)

S6 - Wait Time for Dial Tone Before Blind Dialing, or After “W” Dial Modifier

S6 sets one of two possible parameters:

1. Sets the length of time, in seconds, that the modem will wait before starting to dial after going off-hook when blind dialing.
2. If enabled by country options in the INF file, S6 sets the length of time, in seconds, that the modem will wait for dial tone when encountering a “W” dial modifier before returning NO DIAL TONE result code. The modem always pauses for a minimum of 2 seconds, even if the value of S6 is less than 2 seconds.

Range: 2-255 seconds

Default: 2

S7 - Wait Time For Carrier After Dial, For Silence, or For Dial Tone After “W” Dial Modifier

S7 sets one of three possible parameters:

1. Sets the length of time, in seconds, that the modem will wait for carrier before hanging up. The timer is started when the modem finishes dialing (originate), or after the billing delay in answer mode. In originate mode, the timer is reset upon detection of answer tone if allowed by country restrictions.
2. Sets the length of time, in seconds, that modem will wait for silence when encountering the @ dial modifier before continuing with the next dial string parameter.
3. If enabled by country options in the INF file, S7 sets the length of time, in seconds, that the modem will wait for dial tone when encountering a “W” dial modifier before continuing with the next dial string parameter.

Range: 1-255 seconds

Default: 50

S8 - Pause Time For Dial Delay

S8 sets the time, in seconds, that the modem must pause when the “,” dial modifier is encountered in the dial string.

Range: 0-255 seconds

Default: 2

S10 - Lost Carrier To Hang Up Delay

S10 sets the length of time, in tenths of a second, that the modem waits before hanging up after a loss of carrier. This allows for a temporary carrier loss without causing the local modem to disconnect. When register S10 is set to 255, the modem functions as if a carrier is always present. The actual interval the modem waits before disconnecting is the value in register S10 minus the value in register S9. Therefore, the S10 value must be greater than the S9 value or else the modem disconnects before it recognizes the carrier.

Range: 1-255 tenths of a second

Default: 14 (1.4 seconds)

S11 - DTMF Tone Duration

S11 sets the duration of tones in DTMF dialing. This value has no effect on pulse dialing.

Range: 50-255 milliseconds

Default: 95 (95 milliseconds)

S12 - Escape Prompt Delay (EPD)

S12 defines the maximum period, in fiftieths of a second, allowed between receipt of the last character of the three escape character sequence from the DTE and sending of the OK result code to the DTE. If any characters are detected during this time, the OK will not be sent. Note that sending of the OK result code does not affect entry into command mode. (See 3.1.3.)

Range: 0-255 1/50 of a second

Default: 50 (1 second)

S18 - Test Timer

S18 sets the length of time, in seconds, that the modem conducts a test (commanded by &T1) before returning to the command mode. If this parameter value is zero, the test will not automatically terminate; the test must be terminated from the command mode by issuing an &T0 or H command. When S18 is non-zero, the modem returns the OK message upon test termination.

Range: 0-255 seconds

Default: 0

S29 - Flash Dial Modifier Time

S29 sets the length of time, in units of 10 ms, that the modem will go on-hook when it encounters the flash (!) dial modifier in the dial string. The time can be limited as it is a country dependent parameter.

Range: 0-255 10 ms intervals

Default: 70 (700 ms)

S30 - Disconnect Inactivity Timer

S30 sets the length of time, in tens of seconds, that the modem will stay online before disconnecting when no data is sent or received. In error-correction mode, any data transmitted or received will reset the timer. In other modes, any data transmitted will reset the timer. The timer is inoperative in synchronous mode.

Range: 0-255 tens of seconds (0-2550 seconds)

Default: 0 (disabled)

S46 - Data Compression Control

S46 controls selection of compression. The following actions are executed for the given values:

Range: 136 or 138

Default: 138

S46=136 Execute error correction protocol with no compression.

S46=138 Execute error correction protocol with compression. (Default.)

S95 - Extended Result Codes Control

A bit set to a 1 in this parameter, in conjunction with the W command, will enable the corresponding extended result code

The +MR, +ER, and +DR settings also control S95 bits 2, 3, and 5, respectively. The more recent settings of +MR, +ER, and +DR, or host writing of S95 bits 2, 3, and 5, along with the W command setting, determine the corresponding actual result code reporting (see +MR,+ER, DR, and W commands).

Default: 0

Bit 0 CONNECT result code indicates DCE speed instead of DTE speed.

Bit 1 Reserved

Bit 2 Enable +MCR: XXXX result code (XXXX = modulation) and +MRR: XXXX result code (XXXX = rate). (See +MR.)

Bit 3 Enable +ER:XXXX result code (XXXX = protocol identifier). (See +ER.)

Bit 4 Reserved.

Bit 5 Enable +DR result code (XXXX = compression type). (See +DR.)

Bits 6-7 Reserved.

Result Codes

When the modem receives and processes an AT command, it sends a result code to your computer. Telecommunications programs that send AT commands to the modem interpret the result codes to determine whether or not the command was successful. The modem sends either the number or the phrase corresponding to the result code, depending on the setting of the Vn command. The Xn command affects which result codes are displayed.

Code	Result
0	OK The command line executed with no errors.
1	CONNECT A connection has been established.
2	RING A ringing signal has been detected.
3	NO CARRIER The carrier has been lost or was never present.
4	ERROR Invalid command, error in the command line, or command line exceeds 48 characters.
5	CONNECT 1200 The computer to modem connection is 1200 bps.
6	NO DIALTONE No dial tone is detected within the S7 register time limit.
7	BUSY A busy signal has been detected.
8	NO ANSWER Ringing did not stop, indicating that the remote modem did not answer.
9	CONNECT 600 The computer to modem connection is 600 bps.
10	CONNECT 2400 The computer to modem connection is 2400 bps.
11	CONNECT 4800 The computer to modem connection is 4800 bps.
12	CONNECT 9600 The computer to modem connection is 9600 bps.
13	CONNECT 7200 The computer to modem connection is 7200 bps.
14	CONNECT 12000 The computer to modem connection is 12,000 bps.
15	CONNECT 14400 The computer to modem connection is 14,400 bps.
16	CONNECT 19200 The computer to modem connection is 19,200 bps.
17	CONNECT 38400 The computer to modem connection is 38,400 bps.
18	18 CONNECT 57600 The computer to modem connection is 57,600 bps.
19	CONNECT 115200 The computer to modem connection is 115,200 bps.
20	CONNECT 230400 The computer to modem connection is 230,400 bps.
22	CONNECT 75TX/1200RX The originating modem connected with 75 bps receiving and 1200 bps transmitting capabilities; the answering modem connected with 1200 bps receiving and 75 bps transmitting capabilities.
23	CONNECT 1200TX/75RX The originating modem connected with 1200 bps receiving and 75 bps transmitting capabilities; the answering modem connected with 75 bps receiving and 1200 bps transmitting capabilities.
24	DELAYED [hh:mm:ss] The connection failed, and because of country blacklisting requirements, the modem will not dial the number again until the required time (displayed after the result code) has elapsed.

Code	Result
32	BLACKLISTED The connection failed, and because of country blacklisting requirements, the modem will not dial the number again until the modem is turned off and then on again.
33	FAX A fax connection has been established in facsimile mode.
35	DATA A data connection has been established in facsimile mode.
40	CARRIER 300 Carrier detected at 300 bps.
44	CARRIER 1200/75 Carrier detected at 1200 bps receiving and 75 bps transmitting (originating); carrier detected at 75 bps receiving and 1200 bps transmitting (answering).
45	CARRIER 75/1200 Carrier detected at 75 bps receiving and 1200 bps transmitting (originating); carrier detected at 1200 bps receiving and 75 bps transmitting (answering)
46	CARRIER 1200 Carrier detected at 1200 bps.
47	CARRIER 2400 Carrier detected at 2400 bps.
48	CARRIER 4800 Carrier detected at 4800 bps.
49	CARRIER 7200 Carrier detected at 7200 bps.
50	CARRIER 9600 Carrier detected at 9600 bps.
51	CARRIER 12000 Carrier detected at 12,000 bps.
52	CARRIER 14400 Carrier detected at 14,400 bps.
53	CARRIER 16800 Carrier detected at 16,800 bps.
54	CARRIER 19200 Carrier detected at 19,200 bps.
55	CARRIER 21600 Carrier detected at 21,600 bps.
56	CARRIER 24000 Carrier detected at 24,000 bps.
57	CARRIER 26400 Carrier detected at 26,400 bps.
58	CARRIER 28800 Carrier detected at 28,800 bps.
59	CONNECT 16800 The computer to modem connection is 16,800 bps.
61	CONNECT 21600 The computer to modem connection is 21,600 bps.
62	CONNECT 24000 The computer to modem connection is 24,000 bps.
63	CONNECT 26400 The computer to modem connection is 26,400 bps.
64	CONNECT 28800 The computer to modem connection is 28,800 bps
66	COMPRESSION: CLASS 5 MNP 5 data compression has been negotiated.
67	COMPRESSION: V.42BIS V.42bis data compression has been negotiated.
69	COMPRESSION: NONE No data compression has been negotiated.
70	PROTOCOL: NONE No error correction has been negotiated.
77	PROTOCOL: LAP-M LAP-M error correction has been negotiated.
78	CARRIER 31200 Carrier detected at 31,200 bps.

Code	Result
79	CARRIER 33600 Carrier detected at 33,600 bps.
80	PROTOCOL: ALT MNP 4 error correction has been negotiated.
81	PROTOCOL: ALTCELLULAR MNP 10 error correction has been negotiated and cellular powerlevel adjustment has been enabled.
84	CONNECT 33600 The computer to modem connection is 33,600 bps.
91	CONNECT 31200 The computer to modem connection is 31,200 bps.
150	CARRIER 32000 Carrier detected at 32,000 bps.
151	CARRIER 34000 Carrier detected at 34,000 bps.
152	CARRIER 36000 Carrier detected at 36,000 bps.
153	CARRIER 38000 Carrier detected at 38,000 bps.
154	CARRIER 40000 Carrier detected at 40,000 bps.
155	CARRIER 42000 Carrier detected at 42,000 bps.
156	CARRIER 44000 Carrier detected at 44,000 bps.
157	CARRIER 46000 Carrier detected at 46,000 bps.
158	CARRIER 48000 Carrier detected at 48,000 bps.
159	CARRIER 50000 Carrier detected at 50,000 bps.
160	CARRIER 52000 Carrier detected at 52,000 bps.
161	CARRIER 54000 Carrier detected at 54,000 bps.
162	CARRIER 56000 Carrier detected at 56,000 bps.
165	165 CONNECT 32000 The computer to modem connection is 32,000 bps.
166	CONNECT 34000 The computer to modem connection is 34,000 bps.
167	CONNECT 36000 The computer to modem connection is 36,000 bps.
168	CONNECT 38000 The computer to modem connection is 38,000 bps.
169	CONNECT 40000 The computer to modem connection is 40,000 bps.
170	CONNECT 42000 The computer to modem connection is 42,000 bps.
171	CONNECT 44000 The computer to modem connection is 44,000 bps
172	CONNECT 46000 The computer to modem connection is 46,000 bps.
173	CONNECT 48000 The computer to modem connection is 48,000 bps.
174	CONNECT 50000 The computer to modem connection is 50,000 bps.
175	CONNECT 52000 The computer to modem connection is 52,000 bps.
176	CONNECT 54000 The computer to modem connection is 54,000 bps.
177	CONNECT 56000 The computer to modem connection is 56,000 bps.
178	CONNECT 230400 The computer to modem connection is 230,400 bps
180	CARRIER 28000 Carrier detected at 28,000 bps.
181	CARRIER 29333 Carrier detected at 29,333 bps.
182	CARRIER 34667 Carrier detected at 34,667 bps.

Code	Result
183	CARRIER 37333 Carrier detected at 37,333 bps.
184	CARRIER 34667 Carrier detected at 34,667 bps.
185	CARRIER 37333 Carrier detected at 37,333 bps.
186	CARRIER 38667 Carrier detected at 38,667 bps.
187	CARRIER 41333 Carrier detected at 41,333 bps.
188	CARRIER 42667 Carrier detected at 42,667 bps.
189	CARRIER 45333 Carrier detected at 45,333 bps.
190	CARRIER 46667 Carrier detected at 46,667 bps.
191	CARRIER 49333 Carrier detected at 49,333 bps.
192	CARRIER 50667 Carrier detected at 50,667 bps.
193	CARRIER 53333 Carrier detected at 53,333 bps.
194	CARRIER 54667 Carrier detected at 54,667 bps.

Glossary

asynchronous & synchronous modes

Two connected modems can communicate in either asynchronous or synchronous mode.

- In asynchronous mode, both modems can send data at the same time and pause at any time. To ensure that data is not lost, extra bits —called start and stop bits — are used to frame each character sent.

Bell protocols

Bell 103 and Bell 212 are communications protocols that provide a US standard for communicating at specific speeds.

- Bell 103 can be used for communicating at 300 bps.
- Bell 212 can be used for communicating at 1200 bps.

bps (bits per second)

Bits per second (bps) is a measure of the speed of a connection, expressed as the number of bits that can be transferred per second. The higher the number, the faster the connection.

break signal

A break signal is a pause in the data flow that lasts longer than the amount of time required to send one character (including its start and stop bits).

calling tone

A calling tone is a high-pitched, intermittent sound that can be produced by a modem that is originating a data call. Some international telephone agencies require that your modem emit a calling tone so that a person answering your modem's call can immediately identify your modem as a machine and not a human caller.

carrier

The carrier is the telephone line signal used to transfer data between two connected modems. The sound you hear through the modem's speaker when it connects is the carrier signal.

CCITT

The CCITT (International Telegraph and Telephone Consultative Committee) is an international organization which studies telecommunications technology and recommends international telecommunications standards. (See ITU.)

command mode

In command mode, the modem interprets data from the computer as AT commands, instead of transmitting the data to the remote modem. When you first open a telecommunications application, the modem is automatically placed in command mode. When you establish a connection with another modem, your modem switches to on-line mode. Before entering an AT command, you must use the +++ command to return the modem to command mode.

data compression

Data compression is the process by which data is reduced in size when it is sent from your computer to your modem, and then expanded to its original size by the receiving modem. Since the transmitted data has been compressed, it takes less time to send.

DCE (Data Communication Equipment)

Data Communication Equipment (DCE) is the modem connected to your computer. The DCE speed is the speed of data transfer between the modem and the telephone line. The DCE speed is also called the line speed.

DTE (Data Terminal Equipment)

Data Terminal Equipment (DTE) is the computer to which your modem is connected. The DTE speed is the speed of data transfer between your computer and your modem.

DTR (Data Terminal Ready)

A Data Terminal Ready (DTR) signal is sent by the computer to the modem to indicate that the computer (the “data terminal”) is ready to communicate with the modem. DTR can also be used for other purposes, such as signaling the modem to hang up the phone (called “hardware hangup”).

echoing

When the modem is in command mode, it can transmit characters it receives back to the computer. This is called echoing. For example, if you enter a modem command in a telecommunications application, your keystrokes appear in the application window if echoing is turned on. You use the En command to turn echoing on and off.

error correction

Error correction is the process by which errors that occur during data transfer are detected and, if possible, corrected. Modems use error-correction protocols to correct errors. These protocols monitor the received data and request the retransmission of faulty data.

fallback/fallforward

Fallback/fallforward is a process by which two connected modems can increase (fall forward) or decrease (fall back) the speed they are using, without reconnecting. This process takes place when the line conditions change: for example, if the amount of static on the line increases, the modems can fall back to a speed that is reliable even with the increased noise level. The process is almost instantaneous. You use the %En, -Kn, and -Qn commands to control fallback/fallforward.

guard tone

A guard tone is a tone emitted by the modem when it detects a carrier. Different countries use guard tones of different frequencies. For instance, the default guard tone for the United Kingdom is 1800 Hz.

handshaking

Handshaking is a method of controlling the speed of data transfer by signaling when each side of the connection is ready to receive data. This ensures that both sides can keep up and no data is lost. In hardware handshaking, the modem and computer exchange RTS and CTS signals over the connecting cable. In software handshaking, the modem and computer exchange XON and XOFF characters to start and stop data transfer.

ITU

The ITU (International Telecommunications Union), formerly known as CCITT, is an international organization which studies telecommunications technology and recommends international telecommunications standards. These standards enable different devices from different manufacturers to communicate with each other.

K56flex

k56flex is a communications protocol that provides a standard way of transferring data at speeds of

32,000 bps to 56,000 bps.

make/break ratio

The make/break ratio is used in pulse dialing. It specifies the ratio of off-hook (make) time to on-hook (break) time for each pulse. You use the &Pn command to set the make/break ratio. Phone systems in different countries require different make/break ratios.

MNP 4 protocol

MNP 4 is an error-correction protocol, providing a standard way of correcting errors that can occur as data is transmitted or received. MNP 4 provides less efficient error correction than V.42.

MNP 5 protocol

MNP 5 is a data-compression protocol, providing a standard way of compressing data for transmission in order to save transfer time. MNP 5 provides less efficient data compression than V.42bis.

off-hook

When a modem goes off-hook, it claims the telephone line to which it is connected. Taking a modem off-hook is equivalent to picking up a telephone to make or answer a call.

on-hook

When a modem goes on-hook, it releases the telephone line to which it is connected, freeing the telephone line for other uses. This action, which is equivalent to hanging up a telephone, terminates the current data connection.

on-line mode

In on-line mode, data sent from the computer to the modem is transmitted to the remote modem, instead of being interpreted as AT commands. When you establish a connection with another modem, the modem is automatically placed in on-line mode.

parameter

A parameter is an additional value that you must provide along with a command. For example, in the Hn command, the letter n stands for a parameter whose value can be either 0 or 1. You type the actual command as either "H0" or "H1". Most AT commands require at least one parameter, denoted in command descriptions by the letter n. When you enter an AT command, you must substitute a valid parameter value for n. (A few commands require a second parameter, denoted by x.)

pulse dialing

Pulse dialing is a method of dialing in which the modem sends a set of pulses for each number (one pulse for the number 1, two pulses for 2, and so on).

result codes

A result code is a message the modem sends to the computer, indicating the result of an AT command or the status of a connection. If a telecommunications application is active on your computer, the result code appears on your screen. Result codes are reported either as numbers (numeric) or as words (verbose). You use the Vn command to switch between these modes.

retraining

Retraining is a process by which two connected modems can renegotiate the protocol and speed they are using, without having to reconnect. Retraining takes place when the line conditions change: for example, if the amount of static on the line increases. The process normally takes several seconds. You use the %En command to control retraining.

RTS (Request to Send) & CTS (Clear to Send)

Request to Send (RTS) and Clear to Send (CTS) are hardware-handshaking signals. When the computer is ready to send data, it sends a Request to Send (RTS) signal to the modem. When the modem is ready to receive data, it sends a Clear to Send (CTS) signal to the computer.

space

A space is a long period of silence encountered during a modem connection.

S-registers

S-registers are memory locations in the modem where modem settings are stored. You use the Sn=x command to change the setting in an S-register.

touch-tone dialing

Touch-tone dialing is a method of dialing in which each character (0–9, *, #, A, B, C, D) is represented by a different tone.

V.21 protocol

V.21 is a communications protocol that provides a standard way of transferring data at 300 bps.

V.22 protocol

V.22 is a communications protocol that provides a standard way of transferring data at 1200 bps.

V.22bis protocol

V.22bis is a communications protocol that provides a standard way of transferring data at 1200 bps or 2400 bps.

V.23 protocol

V.22 is a communications protocol for synchronous and asynchronous half-duplex transmission at 1200 bps, using frequency shift keying (FSK) modulation.

V.32 protocol

V.32 is a communications protocol that provides a standard way of transferring data at 4800 bps or 9600 bps.

V.32bis protocol

V.32bis is a communications protocol that provides a standard way of transferring data at speeds of 4800 bps to 14,400 bps.

V.34 protocol

V.34 is an error-correction and data-compression protocol that provides a standard way of transferring data at speeds of 2400 bps to 28,800 bps. As an error-correction protocol, V.34 provides a standard way of correcting errors that can occur as data is transmitted or received. As a data-compression protocol, V.34 provides a standard way of compressing data before it is transmitted and decompressing data before it is received.

V.34 annex 12 protocol

V.34 annex 12 is a communications protocol that provides a standard way of transferring data at speeds of 2400 bps to 33,600 bps.

V.42 protocol

V.42 is an error-correction protocol that provides a standard way of correcting errors that can occur as data is transmitted or received. V.42 provides more efficient error correction than MNP 4.

V.42bis protocol

V.42bis is a data-compression protocol, providing a standard way of compressing data before it is transmitted and decompressing data after it is received. V.42bis provides more efficient data compression than MNP 5.

V.90 protocol

V.90 is a communications protocol that provides a standard way of transferring data at speeds of 32,000 bps to 56,000 bps.

XON & XOFF

XON and XOFF are characters used in software handshaking. When the computer is ready to receive data, it sends an XON character. To request a pause in the data flow, it sends XOFF.